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METHOD, COMPUTER PROGRAM PRODUCT, AND DATA PROCESSING SYSTEM FOR ESTIMATING A NUMBER OF ATTENDEES OF A SCHEDULED EVENT IN AN ELECTRONIC CALENDAR SYSTEM

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention relates generally to an improved data processing system and in particular to a method and computer program product for an electronic calendar system. Still more particularly, the present invention provides a method and computer program product for an electronic calendar system adapted to evaluate conflicts in calendar events.

2. Description of Related Art:

An electronic calendar system is designed to maintain useful information for a user. Electronic calendar systems allow maintenance of a personal schedule of activities such as meeting appointments, teleconference schedules, and the like.

Conventional electronic calendar systems allow users to send electronic invitations to other users and for a user receiving an electronic calendar invitation to either accept or decline the invitation. An invitation typically includes a description of the event, a location of the event, and a scheduled start and end time of the event. An invitation decline message may be returned to the user that issued the invitation when the invitation is declined by an invited user. Likewise, an invitation acceptance message may be returned to the user that issued the invitation when the user accepts the invitation. When a user accepts an invitation, the scheduled event is recorded in the electronic calendar of the accepting user. Additionally, a record of the calendar of the user that issued the invitation is updated to reflect the expected attendance by the accepting user. Accordingly, the calendar of the user that issued the invitation includes an indication of the number of users that have accepted the invitation and the inviting user can plan for the event in response to the anticipated attendance.

A user may sometimes receive invitations for conflicting or concurrently scheduled events. Often, the user will accept an invitation to multiple events that conflict, such as concurrently scheduled events. In such an instance, the user is unable to attend one or more events to which the user has accepted an invitation. Thus, users that have planned for events according to the number of invitation acceptances do not have an accurate indication of the number of attendees that will actually attend the event.

Thus, it would be advantageous for an electronic calendar system to provide an indication of an anticipated attendee count based on the number of invitation acceptances provided in response to an issued invitation. It would further be advantageous to provide an electronic calendar system that provides an anticipated attendee count based on a number of accepted invitations that conflict with other invitation acceptances.

SUMMARY OF THE INVENTION

The present invention provides a method, computer program product, and a data processing system for a method of managing event schedules. A plurality of acceptance messages associated with a first scheduled event having a scheduled event time are received. Each of the plurality of acceptance messages are associated with a respective user. A schedule conflict of a user associated with an acceptance message of the plurality of acceptance messages is identified. Responsive to identifying the schedule conflict, a probable attendance is calculated from the plurality of acceptance messages.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented in accordance with a preferred embodiment of the present invention;

Figure 2 is a block diagram illustrating a data processing system in which the present invention may be implemented in accordance with a preferred embodiment of the present invention;

Figure 3 is a diagrammatic illustration of electronic invitations communicated to a data processing system by clients in a network in accordance with a preferred embodiment of the present invention;

Figure 4 is a flow chart of processing performed by an electronic calendar system for resolving scheduling conflicts according to a preferred embodiment of the present invention.

Figure 5 is a flowchart of processing performed by the electronic calendar system for calculating the count of probable attendees of a scheduled event in accordance with a preferred embodiment of the present invention; and

Figure 6 is a diagrammatic illustration of an exemplary invitees list for calculating a weighted estimation of a number of attendees of a scheduled event in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, **Figure 1** depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented. Network data processing system **100** is a network of computers in which the present invention may be implemented. Network data processing system **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers connected together within network data processing system **100**. Network **102** may include connections, such as wire, wireless communication links, or fiber optic cables.

In the depicted example, clients **106, 108, 110**, and **112** are connected to network **102**. These clients **106, 108, 110**, and **112** may be, for example, personal computers or network computers. Clients **106, 108, 110**, and **112** run electronic calendar systems implemented as instruction sets of computer executable code. Network data processing system **100** may include additional servers, clients, and other devices not shown. In the depicted example, network data processing system **100** is the Internet with network **102** representing a worldwide collection of networks and gateways that use the Transmission Control Protocol/Internet Protocol (TCP/IP) suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, educational and other computer systems that route data and messages. Of course, network data processing system **100** also may be implemented as a number of different types of networks, such as for example, an intranet, a local area network (LAN), or a wide area network (WAN). **Figure 1** is intended as an example, and not as an architectural limitation for the present invention.

With reference now to **Figure 2**, a block diagram illustrating a data processing system is depicted in which the present invention may be implemented. Data processing system **200** is an example of a client computer, such as client **106** of **Figure 1**. Data processing system **200** employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures such as Accelerated Graphics Port (AGP) and Industry Standard Architecture (ISA) may be used. Processor **202** and main memory **204** are connected to PCI local bus **206** through PCI bridge **208**. PCI bridge **208** also may include an integrated memory controller and cache memory for processor **202**. Additional connections to PCI local bus **206** may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter **210**, SCSI host bus adapter **212**, and expansion bus interface **214** are connected to PCI local bus **206** by direct component connection. In contrast, audio adapter **216**, graphics adapter **218**, and audio/video adapter **219** are connected to PCI local bus **206** by add-in boards inserted into expansion slots. Expansion bus interface **214** provides a connection for a keyboard and mouse adapter **220**, modem **222**, and additional memory **224**. Small computer system interface (SCSI) host bus adapter **212** provides a connection for hard disk drive **226**, tape drive **228**, and CD-ROM drive **230**. Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

An operating system runs on processor **202** and is used to coordinate and provide control of various components within data processing system **200** in **Figure 2**. The operating system may be a commercially available operating system, such as Windows XP, which is available from Microsoft Corporation. An object oriented programming system such as Java may run in conjunction with the operating system and provide calls to the operating system from Java programs or applications executing on data processing system **200**. "Java" is a trademark of Sun Microsystems, Inc. Instructions for the operating system, the object-oriented programming system, and applications or programs are located on storage devices, such as hard disk drive **226**, and may be loaded into main memory **204** for execution by processor **202**.

Data processing system **200** runs an electronic calendar system by which a user may issue event invitations to a plurality of users. A user, referred to herein as an invitee, receiving the invitation may accept or reject the invitation, and a message indicating the invitees response is communicated to data processing system **200**. An expected number of attendees is calculated based on the number of acceptance messages and detected schedule conflicts of the invitees. In accordance with a preferred embodiment of the present invention, an invitee acceptance message is accounted for as a single unit in a sum of expected attendees if the invitee has no conflicting scheduled events. An invitee acceptance message is accounted for as a value less than one and is weighted in proportion to the number of detected schedule conflicts as described more fully below.

Those of ordinary skill in the art will appreciate that the hardware in **Figure 2** may vary depending on the implementation. Other internal hardware or peripheral devices, such as flash read-only memory (ROM), equivalent nonvolatile memory, or optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure 2**. Also, the processes of the present invention may be applied to a multiprocessor data processing system.

As another example, data processing system **200** may be a stand-alone system configured to be bootable without relying on some type of network communication interfaces As a further example, data processing system **200** may be a personal digital assistant (PDA) device, which is configured with ROM and/or flash ROM in order to provide non-volatile memory for storing operating system files and/or user-generated data.

The depicted example in **Figure 2** and above-described examples are not meant to imply architectural limitations. For example, data processing system **300** also may be a notebook computer or hand held computer in addition to taking the form of a PDA. Data processing system **200** also may be a kiosk or a Web appliance.

Figure 3 is a diagrammatic illustration of electronic invitations communicated to a data processing system, such as data processing system **200** of **Figure 2**, by host clients in network **102** of **Figure 1**. Electronic invitations **302-304** are communicated to data processing system **200** on issue by respective clients. In the illustrative example, invitations **302-304** are issued by User_1, User_2, and User_3 operating clients **108**, **110** and **112** and are received by User_4 at client **106**. Invitations **302-304** are displayed to the user on a display terminal in a graphical user interface that includes user selectable options (designated Accept and Decline). A decline response is communicated to the issuer of the invitation when the user selects the Decline option of a particular invitation and the invitation is discarded from data processing system **200**. When the user selects the Accept option of an invitation, an acceptance message is returned to the issuer of the invitation. The electronic calendar of the invitee is updated to record the scheduled event. For example, the electronic calendar may include or access a table or other schedule store that maintains records of accepted scheduled events and associated properties. The schedule store may be maintained on a storage device, such as hard disk **226**.

Assume for illustrative purposes that the each of invitations **302-304** are accepted by the invited user. As show in **Figure 3**, invitations **302-304** represent a scheduling conflict. For example, invitations **302** and **303** are concurrently scheduled, that is invitations **302** and **303** correspond to events having identical date, start, and end times. Additionally, invitation **304** corresponds to an event that has a scheduled date and time that partially overlaps with the scheduled date and event times of invitations **302** and **303**.

When the user accepts an invitation, an acceptance message indicating the invitee acceptance is communicated to the inviting user, e.g., client **106**. The electronic calendar system of the inviting user is then updated to reflect the acceptance of the invitees scheduled attendance. The inviting user may then plan the scheduled event accordingly. In the present example, the invited user can only attend one of the scheduled events, and thus the acceptance messages communicated to the other inviting users does not provide an accurate indication of the respective event attendances. In accordance with a preferred embodiment of the present invention, an electronic calendar system periodically evaluates the scheduled events of users to determine schedule conflicts and to calculate an estimated count of attendees that may attend a scheduled event.

Figure 4 is a flow chart of processing performed by the electronic calendar system for resolving scheduling conflicts according to a preferred embodiment of the present invention. The electronic calendar system is initialized (step **402**), and an invitation list of invitees is generated (step **404**). Generation of an invitation list may be performed by input of a set of email address, network device addresses, user names, or the like by the inviting user.

An invitation message is sent to each of the invitees of the invitation list (step **406**) and the electronic calendar system awaits reply messages (step **407**). A list or record of potential attendees is generated in response to receipt of acceptance messages by data processing system **200** (step **408**). A probable number of attendees that may be expected to attend the event is then calculated based on the acceptance messages and detected schedule conflicts. The number of calculated probable attendees may then be retrieved, displayed, or otherwise provided to the user of data processing system **200**. The calendar application may then exit (step **412**).

Figure 5 is a flowchart of processing performed by the electronic calendar system for calculating the count of probable attendees of a scheduled event in accordance with a preferred embodiment of the present invention. The electronic calendar system begins by retrieving a list or record of invitees that have accepted the invitation to a particular scheduled event (step **502**). In the illustrative example, a number N of invitees have accepted respective invitations to a scheduled event. An Attendees variable that stores a value of the expected number of attendees to a scheduled event to which an electronic invitation has been issued is initialized to zero (step **503**). A counter variable i is then initialized to 1 (step **504**).

The electronic calendar system then polls user i for evaluation of any scheduling conflicts with the scheduled event (step **506**). For example, the client from which the invitation was issued may send an interrogation to user i for an indication of any events that overlap or are commonly scheduled with the particular scheduled event. An evaluation is made to determine if a scheduling conflict exists for the interrogated user (step **508**). If no scheduling conflict exists, the Attendees variable is incremented by one (step **510**) and the counter variable i is incremented (step **512**). A comparison of the counter variable with the number N of invitees that have accepted the invitation is then made (step **514**). If all users of the invitees list have been evaluated, that is if the index variable i exceeds variable N, the calendar application proceeds to truncate the number of attendees (step **522**).

If a scheduling conflict is detected at step **508**, a total number of scheduled events are read into a Conflicts variable (step **516**), and an attendance probability value (P) for that particular user is calculated based on the number of scheduled events (step **518**). The probability value is a weighted factor for weighting the estimated attendance for the particular invitee being evaluated. For example, a real number may be calculated as a quotient of 1 divided by the number stored in the variable Conflicts of scheduled events. Thus, the probability value is reduced in proportion to the number of conflicting schedule events. That is, the probability value P provides a numerical indication of the probability that the user will attend the scheduled event based on the total number of conflicting events the user has elected to accept. The Attendees variable is then incremented by the probability value P and the electronic calendar system proceeds to increment the index variable i according to step **512**.

When all of the electronic calendar systems of the invitees that have accepted the event invitation have been evaluated, the Attendees variable is truncated (step **522**) and the value of the Attendees variable is stored or displayed (step **524**). The electronic calendar system then exits (step **526**).

Figure 6 is a diagrammatic illustration of an exemplary invitees list for calculating a weighted estimation of a number of attendees of a scheduled event in accordance with a preferred embodiment of the present invention. The exemplary invitees list **600** comprises a table of records **601** and fields **602**.

List **600** comprises a plurality of records **601** and fields **602**. List **600** may be stored on disk drive **226**, fetched therefrom by processor **202**, and processed by data processing system **200** shown in **Figure 2**. Each record **601a-601c**, or row, comprises data elements in respective fields **602a-602b**.

In the illustrative example, each or records **601a-601c** stores in field **602a** an invitee or user identifier of the associated client that has returned an event acceptance message to the inviting user or client. An attendee increment (ΔAttendee) amount is stored in field **602b**. For example, the attendee increment amount may be set to the calculated probability value of each user that has issued an acceptance message.

Assume three users User_1, User_2, and User_3 have accepted an invitation by an inviting user. Further assume that User_1 and User_2 have not accepted any conflicting scheduled events, and User_3 has accepted three concurrent schedule invitations. The electronic calendar system may periodically interrogate the client systems of User_1, User_2, and User_3 for identification of a schedule conflict. A return value indicating any identified schedule conflicts is then communicated from the client systems in response to the interrogation. For example, the return value may be an integer value indicating the number of concurrent or overlapping scheduled events associated with the particular user's client system being interrogated. Preferably, the return value provided by the client system only indicates the number of conflicting events and does not provide detailed information regarding a user's other scheduled events. In another embodiment, a user may be required to configure a calendar application to disclose schedule conflicts. In the illustrative example, User_1 and User_2 have no schedule conflict and thus a value of one is respectively assigned to field **602b** of records **601a** and **601b**. User_3, having accepted an invitation to three concurrent events, is assigned a value of 0.33. The attendees increment values of field **602b** may then be summed and truncated indicating a probable attendance of two attendees. In the illustrative example, the truncated sum (Attendance) of the attendee increments is two, thus indicating the likelihood that one less invitee that has accepted the invitation will actually attend the scheduled event. List **600** is preferably output on a display device for viewing by the inviting user. For example, list **600** may be displayed in a user interface so that an inviting user can easily identify users that have accepted an invitation to a scheduled event but that may potentially not attend the scheduled event. Additionally, the estimated attendance calculated as described above may be output for viewing by the user.

In accordance with another embodiment of the present invention, detected schedule conflicts may be used to calculate a meeting status value indicative of the likelihood that the scheduled meeting will be held. For example, a meeting status probability value having a range of zero to one may be calculated as a quotient of the number of invitees that have accepted the scheduled event and the total number of conflicting acceptance messages issued by the invitees that have accepted the invitation. For example, a meeting status for the example provided in **Figure 6** may be calculated as follows:

Meeting status: 3 invitees/5 acceptances = 0.6

Additionally, a meeting status value may be translated to a corresponding color-coded graphic to visually indicate the current meeting status. For example, a scheduled event with a meeting status of 0.9 and above may be graphically coded as green for visual output on a display device, a scheduled event with a meeting status of 0.5 to 0.9 may be gray for visual output on a display device, and a meeting status value below 0.1 may be red for visual output on a display device. Thus, a user can easily identify the state or likelihood that a scheduled meeting will take place.

In yet another embodiment, the meeting status may be viewed by at least one of the invitees. For example, an invitee may interrogate an inviting user's calendar for a meeting status value. The meeting status value may be conveyed to an interrogating invitee as a numerical value calculated as a quotient as described above.

Thus, the Attendees variable provides a calculation of the number of invitees that may be expected to attend a scheduled event by accounting for scheduling conflicts of invited users. Users that have no scheduling conflict are accounted for by a unit increment of the Attendees variable. Users that are scheduled to attend one or more events that conflict with the event of the invitation are accounted for as a weighted increment of the Attendees variable. The weighted increment is preferably calculated directly proportional to the number of conflicting scheduled events. It should be understood that the description for calculating an estimated attendance is exemplary only, and other implementations may be suitably substituted for those described.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.